maining half of the book deals with the early histogenesis of the nervous system, and is practically a recapitulation of the author's previous results, all, however, carefully re-studied in the light of additional material, and copiously illustrated with original photographs.

Apart from its scientific value, for which, indeed, the author's name is a sufficient guarantee, the book is a striking testimony to the debt neurology owes the late Prof. His, for not only is the entire work, comprising practically all that is known of the development of the human brain, based on the author's own observations, but most of the facts here described owe their first explanation to Prof. His.

In the introduction, the author briefly describes his methods, chief of which is his "graphic reconstruction," originally described by him in 1880, the only difference being that photographs of serial sections are now used instead of drawings. Following this is a tabular statement of the embryos used, and a discussion of the difficulties of age estimation, and the introduction closes with an earnest appeal for systematic measurements of all prematurely born embryos at gynæcological institutions.

The first portion of the book deals with the development up to the close of the first month, and commences with an account of the author's myelospongium, which, in opposition to Koelliker, he believed to be a syncytial network formed by the union of outgrowths from the spongioblast cells.

The author originally held that connective tissue cells took part in the formation of the definitive neuroglia, and especially that this was the mode of origin of Deiter's cells; in the present work, however, he agrees with the majority of neurologists that the original neural plate is alone concerned in the formation of the supporting tissue.

The author's "Keimzellen," as he showed in 1891, form both nerve cells and glia cells, and, as Schaper maintained in 1897, they are merely undifferentiated cells of the myelospongium in active multiplication, not, as the author originally supposed, a special form of cell to be distinguished from all other cell-elements in the neural plate.

The author gives a brief criticism of recent papers in opposition to the neurone conception, on behalf of which, it will be remembered, Prof. His was one of the first advocates; in particular he deals with Bethe's paper of 1903, in which the nerve is made to arise from a linear syncytial cell series which also later forms Schwann's sheath; His shows that Bethe is really dealing with the mesenchymatous sheath, which in the lower vertebrates, *i.e.* chick, appears very early; in man, as His's photographs clearly show, there is no possibility of confusing the growing end of the non-medullated nerve bundle with the surrounding tissue, and especially is this the case with Meynert's "fremdartiger" strands, as these grow into regions of the myelospongium practically free from cells. This portion of the book closes with a full description of the neural tube of an embryo at the end of the fourth week, "Embryo N" already described in previous papers.

The second portion of the book deals with the development of the cerebral hemispheres, and commences with a description of the author's well-known models; this is followed by a detailed account of the histogenetic differentiation of the hemispheres up to the close of the first month, and is illustrated by numerous exceedingly clear photomicrographs. A few pages follow on the blood vessels of the fore-brain. The last twenty-five pages deal with the origin of the intramedullary tracts.

The whole book is written expressly for the professed neurologist, and abounds in tabular statements, references to individual embryos, and so forth; but there is much, especially in the earlier parts of the book, which is also of interest to the student of general morphology, and it is on behalf of such students that we could wish the numerous excellent photographs of brain sections had been provided with reference letters.

No bibliography accompanies the book, a want duly apologised for in the preface. It should also be noted that, as indicated above, the whole development of the brain is not dealt with; in the author's words,

> "Ich theile mit, was mir mehr oder minder abgeschlossen vorliegt. Die Zwischenkapitel hoffe Ich, falls mir Leben und Arbeitskraft bleiben, in absehbarer Zeit zu können."

All zoologists will regret that this hope is not destined to be fulfilled. G. C. C.

THE TURBELLARIA AS PARASITES AND PARASITE-CARRIERS.

Die Turbellarien als Parasiten und Wirte. By L. von Graff. Pp. vi+65. (Graz: Leuschner und Lubensky's Universitäts-Buchhandlung, 1903.) Price 14.50 marks.

PROF. VON GRAFF'S latest work dealing with the Turbellaria is no less interesting than any of its predecessors, and students of parasitology must stand greatly indebted to him for putting together in such an accessible and stimulating form a full summary of all that is at present known of parasitism amongst the Turbellaria. The first half of the work is devoted to an account of the anatomy of six species of parasitic rhabdocœls. Although all of these have been previously described by von Graff himself, or by other writers, the ampler accounts here given clear up many doubtful points and supply precise information not hitherto available on various anatomical features. This part of the work is illustrated with three plates of great excellence.

The second part is devoted to considerations of a more general character. It includes a list of all known Turbellaria which have adopted a parasitic or commensal habit Amongst them von Graff distinguishes four principal grades of parasitism, namely, (1) occasional commensalism; (2) ectoparasitism; (3) occupation of some chamber in the body of the host which communicates with the exterior; and (4) endoparasitism. The author points out that the effects of parasitism of the second and third grades do not pro-

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duce any very marked results on the parasite. The development of organs of adhesion is not greater than in the free-living species. Eyes may or may not be present, and the size of the pharynx varies with the species. The character shared by the largest number of representatives of these groups appears to be the loss of cilia, especially on the dorsal surface. There is hardly an indication of that increase in size of the genital glands so conspicuous in endoparasitic forms where the eyes and adhesive organs are frequently absent, the pharynx and nervous system much reduced, whilst the body, on the other hand, is invariably completely ciliated. As might be expected, the number of families represented in grades (2) and (3) is greater than the number of those which contain endoparasites; the majority of the latter belong to the Vorticidæ. The hosts most affected by parasitic Turbellaria are holothurians, crustacea, and mollusca. Other echinoderms, worms, tunicates, and vertebrates are also preyed upon to a lesser extent.

Von Graff makes some interesting comments on the classification of the platyhelminthes. The species of the genus Temnocephala usually regarded as transitional forms between the Turbellaria and monogenetic trematodes might, he points out, be referred with equal justice to the vorticid genus Derostoma. Again, Fecampia, when sexually ripe, agrees in characters of systematic importance with the cestodes. In fact, "the more thorough our knowledge of the platyhelminthes becomes, the more difficult it is to define the classes of the phylum. But just as so-called bad species are of value to the student of evolution, so these 'bad classes' of the flat-worms supply him with arguments which are the more convincing in that they rest on the sure ground of ascertained morphological facts."

The work concludes with a useful list of the very numerous parasites with which the Turbellaria themselves may be infected. These range from symbiotic algæ and bacteria to trematodes and nematodes. It is curious that the first recorded orthonectid, found by Keferstein in *Leptoplana tremellaris* thirty-five years ago, has not yet been adequately described. It differs considerably from the other orthonectids noticed since then.

F. F. Laidlaw.

OUR BOOK SHELF.

Applications of the Kinetic Theory to Gases, Vapours, and Solutions. By W. P. Boynton, Ph.D. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1904.) Price 7*s.* net.

There are probably few mathematicians who can follow the long and difficult investigations by which it has been attempted to dispense with the second law, and to represent thermodynamical properties of matter as the changes which must necessarily take place in a molecular system for which the principles of dynamics and the laws of probability are assumed to hold good. Such attempts have been found practically in every case to involve some *further* assumption, whenever a kinetic theory has been applied to the consideration of irreversible phenomena, and Mr. Burbury has unearthed this inevitable assumption when it has escaped the attention of writers of several recent papers. It is probably as impossible to build up an irreversible thermodynamical system out of reversible dynamical elements without any assumption as it is to build up a Euclidean geometry without some axiom of parallels.

But apart from such considerations as this, a kinetic theory is of considerable use to the ordinary physicist in furnishing him with a mechanical representation of the properties of matter in its various states. Dr. Boynton has taken as his standard the requirements of a reader who is familiar with the elements of the calculus, and he has produced a book which will be of great value to students both of physics and of chemistry.

It is perhaps unfortunate that those English physicists who are most competent to write books like the present one are usually too much tied down by other duties to undertake such work, especially as the task is in most instances an unprofitable one to the author. It is therefore satisfactory to find that Dr. Boynton's book is written so much on the lines of an English text-book that it seems well suited for introduction into this country. The features which we particularly like are, firstly, that the author is careful to give his readers no excuse for believing he has proved a result when he has only given an elementary investigation of it, and secondly, that instead of introducing irrelevant philosophical digressions or views of his own, he has kept strictly to an exposition of commonly accepted theories.

It is much to be wished that the same could be said of all the books which find their way into our class-rooms from the other side of the water. It is because they do not generally come up to the present standard of excellence that the difficulty of writing English text-books that are worth writing is to be regretted.

G. H. B.

Handbuch der Physik. By Dr. A. Winkelmann. Second Edition. First part of vol. iv., Electricity and Magnetism. 140 figures. Price 12 marks. First part of vol. vi., Optics. 170 figures. Price 14 marks. (Leipzig: Barth, 1904.)

Every student of physics will share the satisfaction of the editor of this treatise that a second edition was called for so soon; for he has found it to be an indispensable storehouse of expert knowledge in all branches of the subject, and the need for another edition enables it to be brought once more abreast of the rapidly advancing tide of knowledge.

The book is of the nature of an encyclopædia, for each section is written by an expert in the section; twenty-two of the leading physicists of Germany collaborate in this way with Dr. Winkelmann, the editor, in its production. Of the two parts before us, that on electricity and magnetism is contributed by Drs. Graetz and Auerbach, while the part on optics is the work of Drs. Czapski, von Rohr, and Eppenstein.

References are brought up to the middle of 1902. Thus amongst electrical instruments the Dolezalek electrometer finds a place; the large amount of recent work on the properties of dielectrics is very amply discussed, including the double-refracting properties for electric waves. Great stress is laid on the important advances made in the construction and standardisation of standard cells.

The optical portion is wholly occupied with geometric optics and applications to optical instruments. The fact that the writers are connected with the firm of Zeiss is a sufficient guarantee of the quality of their contributions. The only regret that one feels in glancing through the book is that the tremendous

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